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Introduction

This is one in a series of booklets prepared to assist students who are learning to use a calculator. They have been prepared by staff in The Learning Centre from the Office of Preparatory and ACademic Support (OPACS) at USQ. The series comprises:

Mastering the Calculator

- Using the Casio *fx*-100s (also suitable for Casio *fx*-570)
- Using the Casio *fx*-100AU
- Using the Casio *fx*-82LB
- Using the Casio *fx*-82MS
- Using the Casio *fx*-82TL
- Using the Sharp EL-531LH
- Using the Sharp EL-556L
- Using the Sharp EL-531RH

The instructions in this booklet only explain **some** of the keys available on your calculator necessary for basic work in data manipulation. If you require more assistance please contact The Learning Centre. If you would like information about other support services available from **The Learning Centre**, please contact

The Learning Centre (TLC)
Learning and Teaching Support Unit (LTSU), S-Block
The University of Southern Queensland
Telephone: 07 4631 2751
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Home page: http://www.usq.edu.au/ltsu

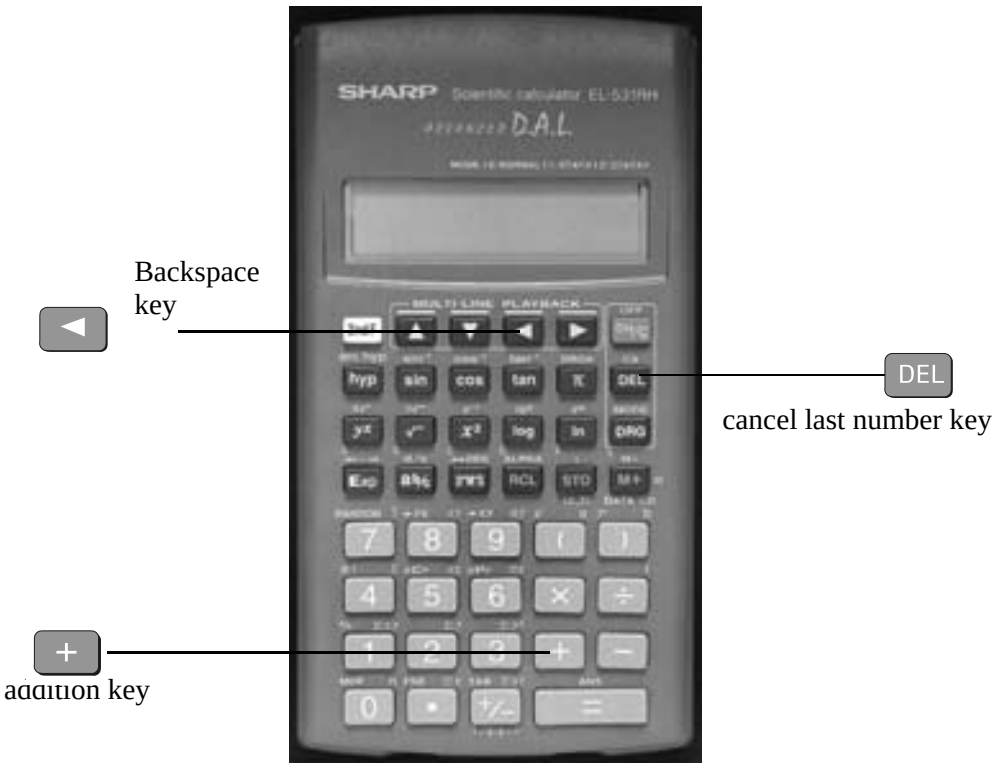
A word about starting out

- Make sure you are in the correct mode selection and that all previous data is cleared.
- For e.g. to perform arithmetic operations press mode 2nd F DRG 0
- To clear all values press ON/C
- To clear memory press 0 STO M+ ON/C
- If your calculator has FIX or SCI or ENG on the display press FSE Σx 2nd F • until the letters disappear.
- If your calculator has RAD or GRAD on the display press DRG until the letter DEG appears.
- If all else fails press the RESET button on the back of your calculator

  (e.g. - after replacing batteries
  - to clear all memory content
  - when an abnormal condition occurs and all keys are inoperative).

1. Addition and subtraction

1.1 To add numbers



Find the + key

(it is shown on the photograph of the calculator here).

Example

To add 7 and 3, type

7 + 3 =

The display should read 10

Example

I want to find the total amount I earned in the past four weeks. If I earned $471, $575, $471 and $528, the key strokes would be

4 7 1 + 5 7 5 + 4 7 1 + 5 2 8 =

The display should read 2045.

1.2 Sometimes you make an error when typing in a number

If this happens use the DEL key to cancel the number and then type in the correct number and continue.

Example

If you want to enter 3 + 4 but accidentally type 3 + 5

press DEL to cancel the 5.

Now type 4 =

Note that the DEL key cancels just the last digit.

Example

If I want to add 471 and 575 but I typed

4 7 1 + 5 7 6

I can cancel 6 by typing DEL and then typing 5 =

The display should read 1 046. Each time DEL is used, the last digit is cancelled.

Try practising cancelling with the DEL key until you are comfortable with its use.

1.3 The ◄ key is used when you to delete a whole number

Example

If you typed:

471 + 566

but you wanted 471 + 576

press the ◄ key. Note the 566 disappears. Press the ► key again, the + sign becomes static. Now type in 576 then = .

The display should read 1 047.

1.4 When you want to edit, use the ◄ ► keys to move the cursor to the left or right

Example

If you typed 471 + 568 +, but you wanted 576

Press the ◄ until the number 8 begins to flash [press ► to undo]

Press DEL and “8” disappears. Now type in “7” and press ► until the + sign stops flashing.

1.5 To subtract numbers

Find the − key (it is shown on the photograph of the calculator following).

Example

To subtract 35 from 257, type

2 5 7 − 3 5 =

The display should read 222

Example

348 – 24 – 19

The keystrokes are

The display should read 305.

Sometimes you may have a sum like this:

-7 + 4

You can use the key.

The key strokes are

The display should read -3.

You could also use the keystrokes

In this case the calculator recognises the – as a negative (not recommended to do it this way).

2. Multiplication and division

2.1 To multiply numbers

Find the [×] key (it is shown on the photograph of your calculator here).

[×] key for multiplication

[÷] key for division

Example

To multiply 7 and 3, type

[7] [×] [3] [=]

The display should read 21

To find 753 × 492, type

[7] [5] [3] [×] [4] [9] [2] [=]

The display should read 370 476

2.2 To divide numbers

Find the key (it is shown on the photograph of the calculator)

Example

To divide 35 by 7, type

The display should read 5

To divide 7 905 by 85, type

The display should read 93

To divide 60 by 5 and then by 4 type

The display should read 3

2.3 Combining multiplication and division

Example

If the question is

$\frac{27}{7 \times 4}$ then

it is really 27 ÷ 7 ÷ 4.

Try it.

The display should read 0.964285714

3. Brackets

Find the set of bracket keys on your calculator.

The EL-531RH allows you to use many sets of brackets.

Example

Do the calculation 471 – (93 + 11 + 2) on the calculator.

The keystrokes required are

4 7 1 − (9 3 + 1 1 + 2) =

The display should read 365

Sometimes in calculations you will see other grouping symbols, for example, { } (called braces), [ ] (called square brackets).

Try these examples:

Exercise 1

(a) $25 + (7 + 2 - 4)$

(b) $18\ (3 + 7)$ [a multiplication sign is understood $18 \times (3 + 7)$]

(c) $4 + 5\ [2\ (3 + 7)]$ [to use two sets of brackets just press the same button]

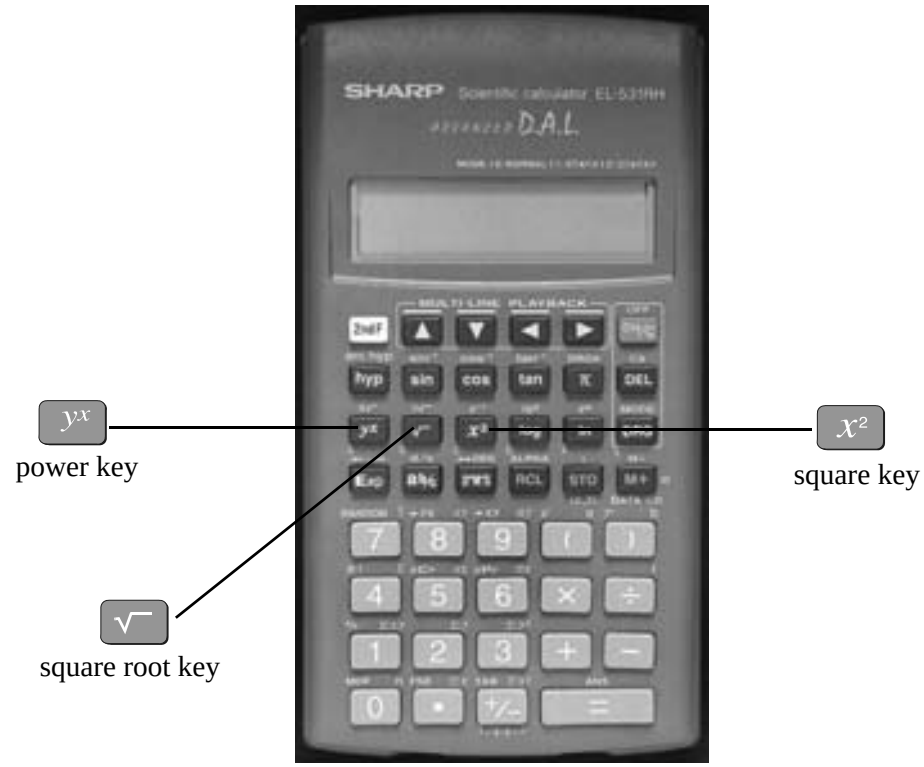
(d) $\dfrac{5}{(3 + 2)}$

Answers: 30; 180; 104; 1

4. Powers

4.1 Squaring and higher powers

6^2 means 6×6. You can use the square key to do this calculation. (It is shown on the photograph of your calculator here.)



Press [6] [x^2] [=]

the display should read 36.

Or you can use the power key on your calculator.

Find the y^x key on your calculator.

Example

To square 6,

that is, find 6^2, type

The display should read 36

[The first number you put in is the 6. This is the *y* and the second number you put in (2) is *x*. That is why it is called the y^x key.]

To find 27^3 the required key strokes are

and the display should read 19683.

If you have learnt your multiplication tables you will already know the squares of the whole numbers from 1 to 12 and thus be able to complete much of the following table.

Exercise 2

Use your calculator to find the squares of the whole numbers from 13 to 25 and any other squares you are unsure of.

$1^2 = 1$	$11^2 =$	$21^2 =$
$2^2 = 4$	$12^2 =$	$22^2 =$
$3^2 = 9$	$13^2 =$	$23^2 = 529$
$4^2 =$	$14^2 =$	$24^2 = 576$
$5^2 =$	$15^2 =$	$25^2 = 625$
$6^2 =$	$16^2 =$	
$7^2 =$	$17^2 =$	
$8^2 =$	$18^2 =$	
$9^2 =$	$19^2 =$	
10^2	20^2	

Exercise 3

You can use this key for other powers as well. Try these examples

(a) 7^4

(b) 8^{10}

(c) $(0.4)^6$ (you **do not** have to type the brackets in)

(d) $(-7)^6$ (you do not need to type the brackets in)

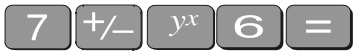
(e) $5^{0.4}$

Answers:

(a) 2401

(b) 1073741824

(c) 4.096×10^{-3} or 0.004096 (you move the decimal 3 places to the left)

(d) 

117649

(e) 1.903653939

4.2 Square root

Finding the **square root** of a number 'undoes' or 'neutralises' the squaring of the number and vice versa. The symbol for square root is

$\sqrt{\ }$ (This is called the radical sign)

The square root of 36 is written as $\sqrt{36}$

Now because $6^2 = 36$, $\sqrt{36} = 6$.

Find the square root key on your calculator and type

The display will read 6.

What do you think $\sqrt{81}$ is? $\sqrt{81}$ =

You should have said 9 because $9^2 = 81$

(Check your calculator)

Exercise 4

Try these by looking at the table of squares you completed on the previous page and then check your answers on your calculator

(a) $\sqrt{16}$ = (a) $\sqrt{49}$ =

(a) $\sqrt{144}$ = (a) $\sqrt{169}$ =

(a) $\sqrt{100}$ = (a) $\sqrt{121}$ =

(a) $\sqrt{441}$ = (a) $\sqrt{361}$ =

The answers are 4, 12, 10, 21, 7, 13, 11, 19.

Let's now check that taking the square root neutralises squaring.

Try this on your calculator.

Find the square root of 3 squared that is, $\sqrt{3^2}$

The key strokes required are

The display should read 3

Because **squaring** and taking **square roots** are **inverse operations**, the **order** of the operatons **can be reversed** and the number is unaffected.

So the square, of the square root of 3, should also equal 3

Try it on your calculator. The key strokes required are

Exercise 5

Complete the following without using the calculator

(a) $\sqrt{7}^2$ =

(b) $\sqrt{7^2}$ =

(c) $\sqrt{10^2}$ =

(d) $\sqrt{\square}^2$ = 10

(e) $\sqrt{\square^2}$ = 625

(f) $\sqrt{\square}^2$ = 144

(g) $\sqrt{64}$ = $\square$, because 8^2 = $\square$

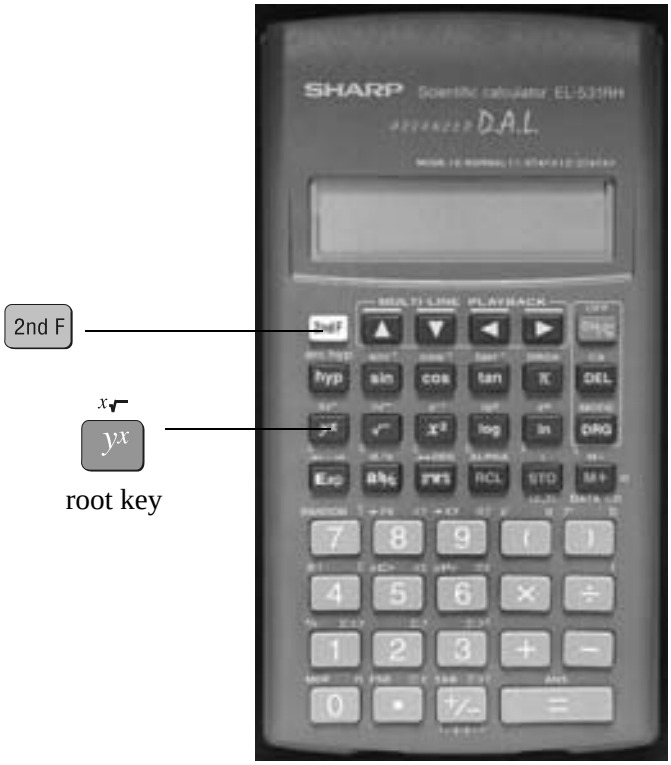
(h) $\sqrt{121}$ = $\square$, because = 121

(i) $\sqrt{225}$ = $\square$, because = $\square$

Check your answers on the calculator.

4.3 Other roots

You can also use the root key on the calculator. Find the $\sqrt[x]{\ }$ on your calculator. To get to this key you must press 2nd F first.



Look at the examples below.

Examples

(a) $9^{½}$

√ 9 =

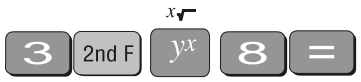
and the display should read 3.

or

2 2nd F $\sqrt[x]{\ }$ 9 =

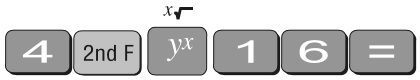
and the display should read 3.

(b) $8^{\frac{1}{3}}$



and the display should read 2.

(c) $16^{¼}$



and the display should read 2.

Note:

- Root key is a function above the power key, so you will need to activate it with the SHIFT key

- See the key $\sqrt[x]{\ }$. The *x* stands for the root you want to take so it is typed first.

- From the examples above you may have seen that $8^{\frac{1}{3}} = \sqrt[3]{8}$. $8^{\frac{1}{3}}$ is called a fractional index.

5. Fractions

How do you add $\frac{1}{12}$ and $\frac{4}{63}$? Normally you would have to find a common denominator of 252.

So:

$$\frac{1}{12} + \frac{4}{63} = \frac{21}{252} + \frac{16}{252} = \frac{37}{252}$$

Or you can use your calculator to add fractions. Find the

$a\frac{b}{c}$ key

On the $a\frac{b}{c}$ key the '*a*' represents the whole part of a mixed number and the '$\frac{b}{c}$' represents the fraction part of a mixed number.

When the number you are typing is a proper or improper fraction the '*a*' is zero and there is no need to type a value for it.

The key storkes required for the calculation $\frac{1}{12} + \frac{4}{63}$ are:

1 ab/c 1 2 + 4 ab/c 6 3 =

and the display will show 37 ⌜ 252 which is read as $\frac{37}{252}$

Example

Find $8\frac{1}{9} + \frac{63}{72}$

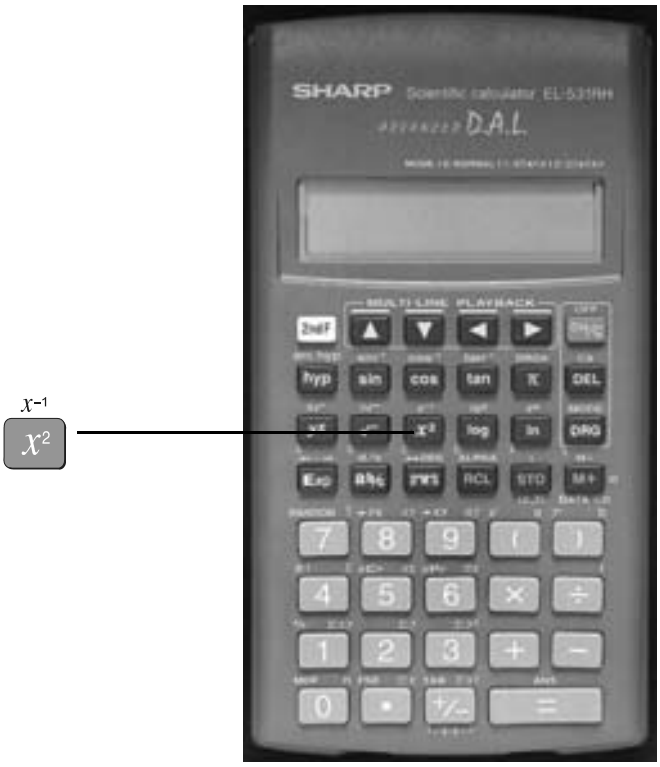
Using the calculator the key strokes are:

and the display will show 8 ⌜ 71 ⌜ 72 which is read as $8\frac{71}{72}$

Note if you now press the display will read $\frac{647}{72}$. So this key turns a mixed fraction into an improper fraction.

If you press the key a second time the decimal equivalent is displayed,
i.e. 8.9861111

6. Using the x^{-1} key

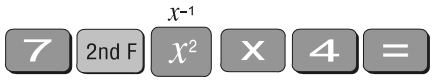


This is a very useful key in more complex calculations. Find the x^{-1} key on your calculator.

Example

$\frac{4}{7}$ is the same as $4 \times \frac{1}{7}$

You can input this in your calculator by pressing



The answer should be 0.571428571. This would be the same as if you just typed $4 \div 7$

Take another example

$$\frac{4}{(8+3) \times 7}$$

Type:

The answer should be 0.051948051

7. Scientific notation

Sometimes you may have numbers expressed in scientific notation, i.e., 7.24×10^3 instead of 7240. When a number is multiplied by 10^3, you move the decimal point three places to the right. You can do this on the calculator by using the Exp key.

Press [7] [•] [2] [4] [Exp] [3] [=], the screen shows

Where 7.24E03 is the calculator's computational symbols for 7.24×10^3

Example

If you want to multiply two numbers e.g. $8.34 \times 10^{-2} \times 4.28 \times 10^5$. Press

[8] [•] [3] [4] [Exp] [+/–] [2] [x] [4] [•] [2] [8] [EXP] [5] [=]

and the display will read 35695.2

If you want this answer in scientific notation press both [2nd F] and [FSE •] until sci appears on top of the screen and your display should read 3.56952×10^{04}. If you wish to fix the number of digits displayed, press [2nd F] [TAB +/–] 3, which rounds the number to 3 decimal places.

Practise using the [Exp] key on your calculator

8. Factorial *n*!

Look at your calculator and find the key with the symbol *n*! on it. You will come across this symbol when doing the Binomial Distribution. This is called the factorial key.

Use 2nd F to activate *n*!

n !
4

Use it to find the 3! and 5!. Press 3 2nd F *n* ! 4 =

3! means $3 \times 2 \times 1$

3! = 6

5 2nd F *n* ! 4 =

and $5! = 5 \times 4 \times 3 \times 2 \times 1$

5! = 120

How many ways would you guess that we could arrange ten people?
That is, how large would you estimate 10! to be? Use your calculator to find 10!
You should get 3 628 800.

$$10! = 10 \times 9 \times 8 \times ... \times 3 \times 2 \times 1$$

(Thank goodness this can be done on the calculator.)

Factorial rule

The number of ways of arranging n items in order is known as 'factorial n' which is symbolised as $n!$ where: $n! = n \times (n-1) \times (n-2) \times ... \times 3 \times 2 \times 1$

9. Using memory

To calculate the following it may be useful to use the memory key for each term:

Example:

$$\frac{(9-16)^2}{16} + \frac{(23-16)^2}{16} + \frac{(17-16)^2}{16}$$

To make sure memory is clear, first press

or

and make sure you are in normal calculation mode [may need to press mode 0].

A small M appears in the display when you put something in memory.

To do the calculation above, press the following keys

- this puts the first term (3.0625) into the memory

then press

- this adds the second term (3.0625) into memory

then press

- this adds the third term 0.0625 to memory.

To find the answer press

The answer should be 6.1875.

Example 2

calculate the following:

$$\frac{18}{\sqrt{17}} + \frac{17}{\sqrt{17}} + \frac{12}{\sqrt{17}}$$

to clear the memory press

press the following keys:

your answer should be 11.39917438

(There are other memory keys in your calculator – the A to D, X, Y keys, accessed by using SHIFT STO and RCL – try them yourselves.)

10. Statistics

10.1 Mean and standard deviation – single data

The formula for the mean is $\bar{x} = \frac{\Sigma x}{n}$

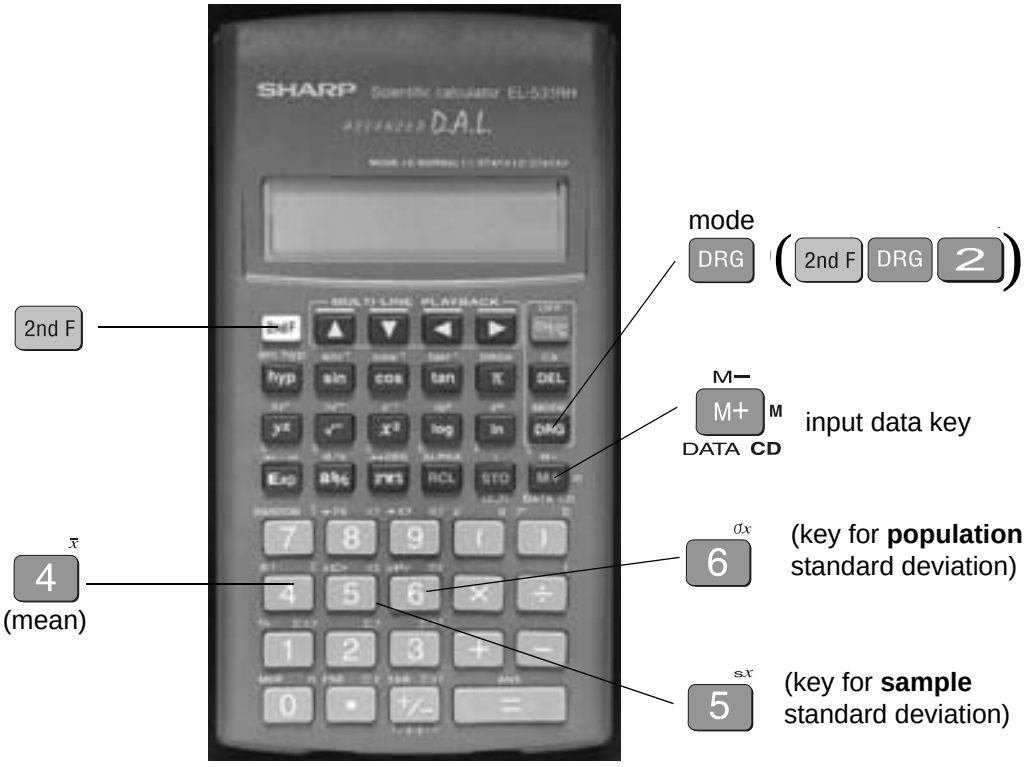
The formulas for the sample standard deviation are

$$s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}} \qquad \text{(Theoretical formula)}$$

$$s = \sqrt{\frac{\Sigma x_i^2 - (\Sigma x_i)^2/n}{n-1}} \qquad \text{(Working formula)}$$

Your calculator will calculate the mean and standard deviation for you (the population standard deviation σ_n or the sample standard deviation σ_{n-1} – in data calculations you will usually use the sample standard deviation.)

The difference between σ and *s* varies with different calculators. On the Sharp EL-556L, σ is denoted by σ*x* and *s* is denoted by s*x* . The position of these purple keys is shown on the diagram below.



To find the mean and standard deviation,

firstly you must access the statistics mode of the calculator by using the keys mode 2nd F DRG

followed by 1 0 STAT X will appear on the left of the screen.

IMPORTANT: Before starting any computations always clear the statistic's memories using CA 2nd F DEL

I will use the data set A (–5, 2, 3, 4, 11) to demonstrate the use of the calculator.

Step 1: Input the observations.

Use the M+ (M; DATA CD) key to input data (no need to press 2nd F).

5 +/– M+ (M; DATA CD) 2 M+ (M; DATA CD) 3 M+ (M; DATA CD) 4 M+ (M; DATA CD) 1 1 M+ (M; DATA CD)

Step 2: Check that the correct number of observations have been inputted. The screen should show $n = 5$.

Or press RCL 0 (n)

The display should read 5.

Step 3: To display the mean press RCL 4 ($\bar{x}$)

and the display should read 3

Step 4: Display the standard deviation (assume the data set is a **sample**) press RCL 5 (nCr s_x)

and the display should read 5.7008771

Example

Use your calculator to find the mean, standard deviation and variance for data set B: –18, 1, 3, 9, 20.

(the variance is the square of the standard deviation)

After you are in the statistics mode and cleared the statistics memories, the keystrokes required are:

The screen should display $n = 5$.

OR

n
RCL 0 and the display will read 5 (you can skip this step)

$\bar{x}$
RCL 4 and the display will read 3. This is the mean $\bar{x}$

nCr $s.x$
RCL 5 and the display will read 13.87443693. This is the sample standard deviation s

x^2 = and the display will read 192.5. This is the variance s^2

The mean is 3, the standard deviation is 13.87 and the variance is 192.5.

The RCL button accesses a number of extra statistical functions.

TAB Σx^2
+/– NEG(-) $= \Sigma x^2$

Σy^2
3 $= \Sigma y^2$

FSE Σx
• $= \Sigma x$

Σy
2 $= \Sigma y$

Σxy
1 $= \Sigma xy$

In the example below, the progressive calculations are shown simply to give you some understanding of the underlying processes – you should do one or two examples in detail and then check them by calculator.

10.2 Mean and standard deviation of frequency distribution

Given below is the frequency table for the weights (kg) of a random sample of 30 first year university female students. Find the standard deviation, the variance and the mean.

Graduate's weight (kg)	Frequency	Cumulative frequency
60	2	2
61	14	16
62	8	24
63	1	25
64	5	30

The calculations needed to obtain the standard deviation without statistical keys for these data are:

$\Sigma x^2 = 60^2 \times 2 + 61^2 \times 14 + 62^2 \times 8 + 63^2 + 64^2 \times 5 = 114\,495$

$\Sigma x = 60 \times 2 + 61 \times 14 + 62 \times 8 + 63 + 64 \times 5 = 1\,853$

$$s = \sqrt{\frac{\Sigma x_i^2 - (\Sigma x_i)^2 / n}{n-1}}$$

$$= \sqrt{\frac{114\,495 - (1\,853)^2/30}{29}} = \sqrt{\frac{114\,495 - 114\,453.6333}{29}} = \sqrt{1.4264}$$

Thus: $s = 1.2$ kg and $s^2 = 1.4$ kg^2

$$\bar{x} = \frac{\Sigma x}{n} = \frac{1853}{30} = 61.8 \text{ kg}$$

Note: In calculations like the above you should carry as many decimals as possible until the final result. The number of decimals to be retained at the end depends on the accuracy of the data values – one rule of thumb is to have one more decimal than in the original data.

Notice how the frequencies were used in the above calculation.

The calculator usage now has a small modification because we have been given the frequencies for the variable values. (There is no need to input each single observation.)

Note: Check that you have cleared all previous data. Press 2nd F CA DEL

The keystrokes required are:

6 0 STO 2 M+ 6 1 STO 1 4 M+ 6 2 STO 8

M+ 6 3 M+ 6 4 STO 5 M+

The display should read $n = 30$

Press RCL $\bar{x}$ 4 and the display should read 61.766667 as the mean $\bar{x}$

Press RCL nCr s.x 5 and the display should read 1.1943353 as the sample standard deviation s

x^2 = and the display should read 1.4264369 as the variance s^2

Thus, as expected

$s = 1.2$ kg, $s^2 = 1.4$ kg^2 and $\bar{x} = 61.8$ kg

Exercise 6

Find the mean, standard deviation and variance of

(a) The annual rainfall data for the years 1971 – 1990

Year	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**
Rain (mm)	1 340	990	1 120	1 736	260	1 100	1 379	1 125	1 430	1 446
Year	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
Rain (mm)	1 459	1 678	1 345	978	1 002	1 110	1 546	1 672	1 467	1 123

(b) The sample of snail foot lengths

Snail foot length (cm)							
2.2	4.1	3.5	4.5	3.2	3.7	3.0	2.6
3.4	1.6	3.1	3.3	3.8	3.1	4.7	3.7
2.5	4.3	3.4	3.6	2.9	3.3	3.9	3.1
3.3	3.1	3.7	4.4	3.2	4.1	1.9	3.4
4.7	3.8	3.2	2.6	3.9	3.0	4.2	3.5

Answers:

(a) Rainfall statistics

mean:

$\bar{x}$ = 1 265.3 mm

standard deviation:

s = 336.4 mm (sample standard deviation)

variance:

s^2 = 113141.7 mm^2

(b) Snail statistics

mean:

$\bar{x}$ = 3.4 cm

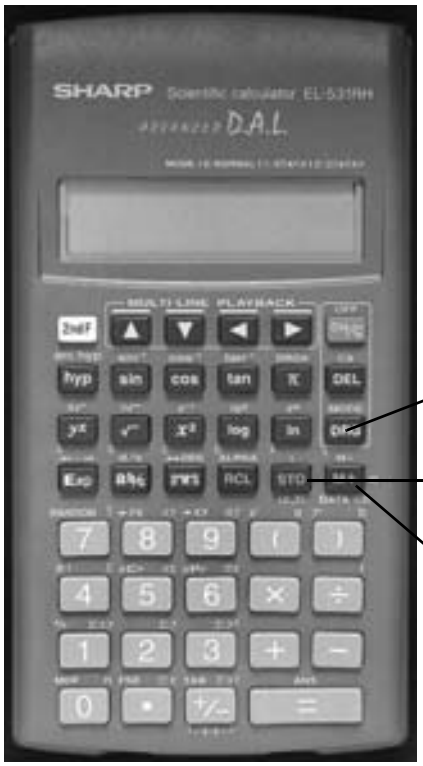
standard deviation:

s = 0.70 cm

variance:

s^2 = 0.49 cm^2

11. Linear regression



Put into linear regression mode and STAT 1 appears

RCL accesses the purple keys

mode
DRG (2nd F DRG 2)

For entering the first set of data STO
(x, y)

For entering the second set of data M+ M
DATA CD

Example

Suppose we had a sample of 10 of the same type of banana. Their lengths and skin thicknesses were measured. Below is a summary of the results.

Banana	1	2	3	4	5	6	7	8	9	10
Length (mm), *x*	16.2	15.8	16.5	14.9	16.9	16.8	15.6	15.6	15.7	15.4
Thickness (mm), *y*	1.1	1.2	1.1	1.0	0.9	1.2	1.1	1.2	0.9	0.8

STEPS

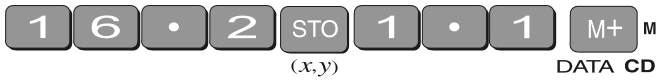
1. To put the calculator into regression mode press (mode) 2nd F DRG 2

2. Think of the sample of bananas as having two variables

   – let *x* be the variable length of banana
   – let *y* be the variable thickness of banana

For each banana you have to put in both numbers.

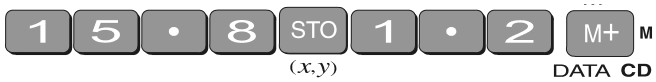
To put in the first set of numbers, press the following keys:



STO (x,y) is used for the 1st variable

M+ M DATA CD is used for the 2nd variable

Continue in this manner. After each input you will see n = _, so you can check to see how many observations you have just entered.



After you have input all the numbers, check to see you have 10 samples.

The display should read 10

To find the linear regression equation in the form

$y = a + bx$

you need to find the value of a and b. These keys are formed as a and b above the (and) keys. The RCL key is used for all keys in purple.

Press RCL (a is 0.3651

Press RCL) b is 0.0430

∴the equation is $y = 0.3651 + 0.0430x$

To find the correlation coefficient press RCL ÷ r

r = 0.1928

There is not a high correlation between the thickness of bananas and the length of bananas tested.

- To find the mean thickness, $\bar{y}$, use RCL 7 $\bar{y}$

The display will read $\bar{y}$ = 1.055 mm

- To find the standard deviation for a sample *sx*, use RCL 5 (nCr sx)

  The display will read *sx* = 0.64325.....

- To find the sum of all lengths, Σ*x*, use RCL • (FSE Σx)

  The display will show Σ*x* = 159.4

- To predict the length, *x*', given the thickness y = 0.6mm for e.g.

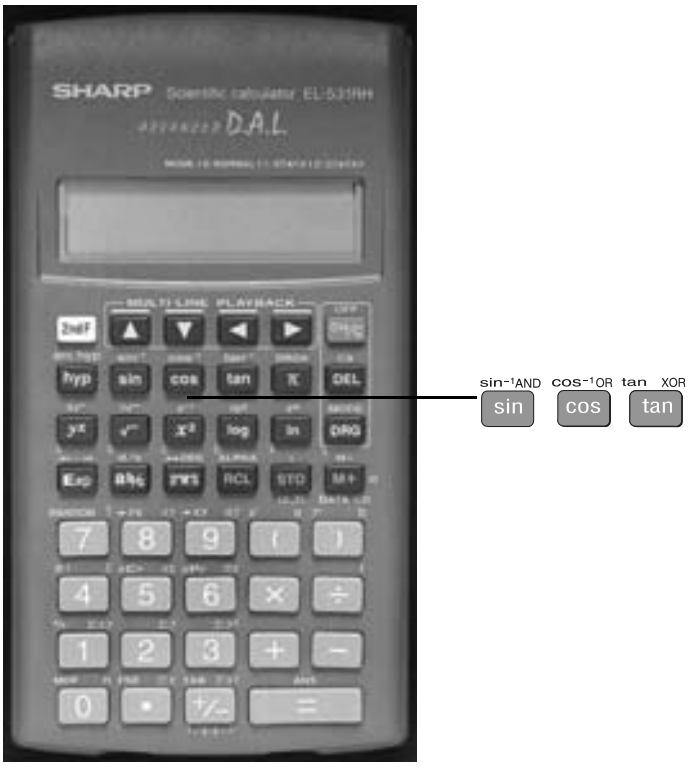
  press 0 • 6 2nd F ((x' a) . The display will show 0.6*x*' 5.46625

- To predict the thickness, y', given the length x = 12mm for e.g.

  press 1 2 2nd F) (y' b) . The display will show 12y' 0.8807....

12. Trigonometric functions

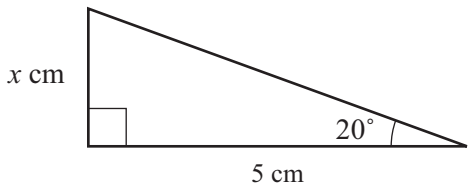
The keys involved are:



Important: Make sure that your calculator is in the correct mode. For example, if your calculator has RAD or GRAD on the display and you wish to work in degrees, press the DRG key until the display shows DEG.

Example 1

In the right-angled triangle below, the length of the side opposite the 20° angle needs to be calculated.



To find the length of the side labelled x cm, use

$$\tan 20° = \frac{x}{5}$$

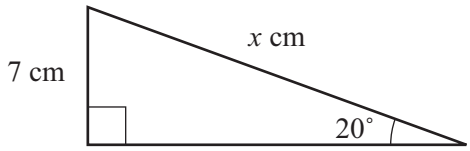
$$\Rightarrow x = 5\tan 20°$$

The keystrokes on the calculator are:

The display should read 1.819851171, so the length of x is about 1.8 cm.

Example 2

In the right-angled triangle below, the length of the hypotenuse needs to be calculated.



To find the length of the side labelled x cm, use:

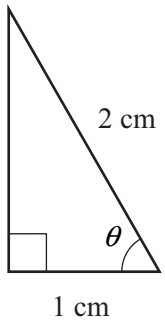
$$\sin 20° = \frac{7}{x}$$
$$\Rightarrow x = \frac{7}{\sin 20°}$$

The keystrokes on the calculator are:

The display should read 20.466631, so the length of the hypotenuse is about 20.5 cm.

Example 3

Given the lengths of two of the sides in the right-angled triangle below, find the value of the angle θ in degrees:



In the diagram, $\cos\theta = \frac{1}{2}$

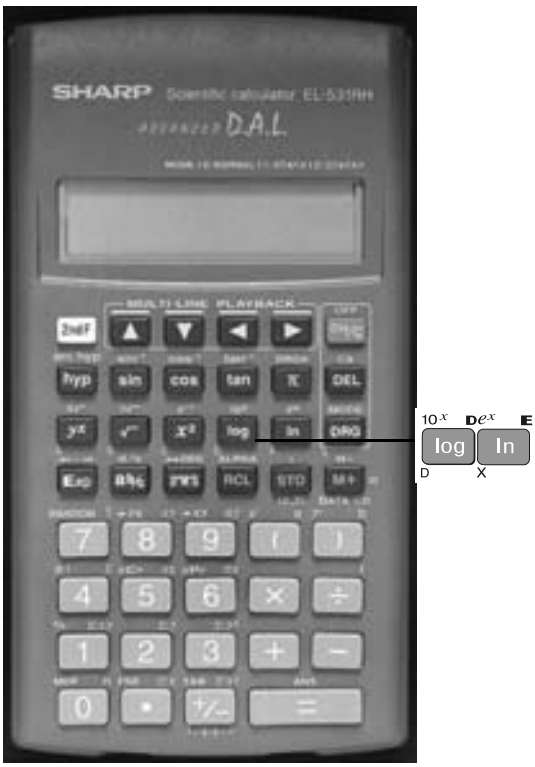
To find the value of θ, you need to use the $\cos^{-1}$ key. The calculator keystrokes are:

Note: You must first get the value of the division by using brackets.

Your display should read 60°. If it does not, check that you are in degree mode.

13. Exponential and logarithmic functions

There are two log keys on your calculator, with their associated exponential keys. The latter are accessed by first using the yellow 2ndF key:



The ‘log’ key uses base 10 and the ‘ln’ key uses base e (natural logarithm).

Example 1

Solve equation $2^a = 20$

Taking logs of both sides;

$$\log 2^a = \log 20$$
$$\Rightarrow a \log 2 = \log 20$$
$$\Rightarrow a = \frac{\log 20}{\log 2}$$

To find the value of *a*, the keystrokes are:

The display should read 4.3219281.

So, $2^{4.32} \approx 20$. Confirm this by using the $\sqrt[x]{\ }$ / y^x key.

Example 2

Given $\log y = 1.584$, find the value of *y*

$$\log y = 1.584$$
$$\Rightarrow y = 10^{1.584}$$

The 10^x key is above the log key. Hence the keystrokes are:

The display should read 38.370725

Example 3 (harder)

Given $\log_x 6 = 1.5$, find the value of *x*

$$\log_x 6 = 1.5$$
$$\Rightarrow \frac{\log 6}{\log x} = 1.5$$
$$\Rightarrow \frac{\log 6}{1.5} = \log x$$

To find log *x*, the calculator keystrokes are:

The display should read 0.5187675.

Since this is the value of log *x*, you still need to find *x* where $x = 10^{0.5187675}$
To utilize the answer of 0.5187675 on your display, use the stored ANSwer key (which is above the = key). Press

Your display should now read 3.3019272

Note: You could use the 'ln' key instead of the 'log' key – the answer would still be the same. Try it!

14. Degrees, minutes, seconds

The key involved is

This key can be used for problems involving degrees, minutes and seconds or hours, minutes and seconds.

Example 1

Suppose that you have a trigonometric problem where the angle involved is given in degrees and minutes. e.g. Find x where $x = 4 \times \sin 25° 36'$

The keystrokes involved are:

The display should show 1.728343, so x is approximately 1.73

Example 2

If you wish to convert an angle in degrees to its equivalent in degrees, minutes and seconds:

e.g. 34.88°, the keystrokes are:

The display should read 34°52°48.00

Example 3

To find the sum of 5 hours 52 minutes 30 seconds and 7 hours 45 minutes 49 seconds:

The keystrokes are:

The display should now read 13°38°19.00 which is 13 hours 38 minutes and 19 seconds.

To convert this number on the display into hours, minutes and seconds, press

The display should read 13.638611 (hours).

Review calculator exercises

1. Perform the following calculations

(i) $(5 + 4) \times 3$

(ii) $12.5 - 8 \div 0.5$

(iii) $\dfrac{3 \times 6 - 8}{4}$

(iv) $\dfrac{12.8}{16.5 - 3.8}$

(v) $\dfrac{7 \times 0.41 + 17}{(4 + 7) \times 2}$

(vi) $\dfrac{2.4}{\frac{3}{4}}$

(vii) $\sqrt{145.6 - 17.2^2 / 5}$

(viii) $\sqrt{345.6 - 17.2^2} / 5$

(ix) $25 + \dfrac{3 \times 27}{1.02\sqrt{30}}$

(x) $(4.1333 - 3.000) \pm 2.015\sqrt{\dfrac{0.1366^2}{6} + \dfrac{0.2000^2}{6}}$

(xi) $\dfrac{(100 - 90)^2}{90} + \dfrac{(50 - 60)^2}{60} + \dfrac{(20 - 30)^2}{30}$

2. The following data is on growth (in $m) in an economy over a 8 year period:

2.5 6.2 -2.1 0.04 8.2 7.4 2.1 -1.7

Calculate (i) Σx (ii) Σx^2 (iii) $(\Sigma x)^2$ Explain in words what each of these mean.

Calculator solutions

1.

(i) $(5 + 4) \times 3$ = 27

Make sure your calculation is in comp mode.

(ii) $12.5 - 8 \div 0.5$ = -3.5

(iii) $\dfrac{3 \times 6 - 8}{4}$ = 2.5

Either $(3 \times 6 - 8) \div 4$, or $3 \times 6 - 8 = \div 4 =$

(iv) $\dfrac{12.8}{16.5 - 3.8}$ = 1.007874

Either $12.8 \div (16.5 - 3.8) =$, or $16.5 - 3.8 =$ [2nd F] [x^2 (x^{-1})] $\times 12.8 =$

(v) $\dfrac{7 \times 0.4 + 17}{(4 + 7) \times 2}$ = 0.9

Either ... $\div ((4 + 7) \times 2)$ or ... $\div (4 + 7) \div 2$

(vi) $\dfrac{2.4}{\frac{3}{4}}$ = 3.2

Either $2.4 \div (3 \div 4)$, or $2.4 \div 3$ $a_{b/c}$ $4 =$

(vii) $\sqrt{145.6 - 17.2^2 / 5}$ = 9.296..

$\sqrt{}$ $(145.6 - 17.2x^2 \div 5) =$

(viii) $\sqrt{345.6 - 17.2^2} / 5$ = 1.41..

$\sqrt{}(345.6 - 17.2x^2) = \sqrt{} \div 5 =$

(ix) $25 + \dfrac{3 \times 27}{1.02\sqrt{30}}$ = 39.4985

$25 + 3 \times 27 \div 1.02 \div \sqrt{}$ $30 =$

(x) $(4.1333 - 3.000) \pm 2.015\sqrt{\frac{0.1366^2}{6} + \frac{0.2000^2}{6}}$ = 1.3325 or 0.9341

Calculator keys: $2.015 \times \sqrt{(0.1366x^2 \div + 0.2x^2 \div 6)} =$ [M+] $+ 4.1333 - 3 =$

Display reads 1.3325

then press [ON/C] [+/−] [RCL] [M+] $+ 4.1333 - 3 =$

Display reads 0.9341

(xi) $\frac{(100-90)^2}{90} + \frac{(50-60)^2}{60} + \frac{(20-30)^2}{30}$ = 6.1111

Calculator keys: $(100 - 90)\ x^2 \div 90 + (50 - 60)\ x^2 \div 60 + (20 - 30)\ x^2 \div 30 =$

2. The following data is on growth (in $m) in an economy over a 8 year period:

2.5 6.2 -2.1 0.04 8.2 7.4 2.1 -1.7

Calculate (i) Σx (ii) Σx^2 (iii) $(\Sigma x)^2$ Explain in words what each of these mean.

To do this on the calculator, you must be in SD mode. Enter the data:

[MODE] [3] [0] 2.5 M+ 6.2 M+ 2.1 ± M+ 04 M+ 8.2 M+ 7.4 M+ 2.1 M+ 1.7 ± M+

Display reads $n = 8$

(i) 22.64 Press the key that says Σx ([RCL] [FSE Σx •])

This gives the total growth over the last 8 years

(ii) 178.4016 Press the key that says Σx^2 ([RCL] [TAB Σx^2 +/−]) This gives the sum of the squares of the growth in each year

(iii) 512.5696 Press Σx and x^2. This gives the square of the sum of the growth.

Press [RCL] [FSE Σx •] [x^2] [=]

Your Notes